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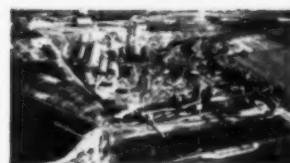
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Editor - WILLIAM J. MEGILL

This magazine is dedicated to the presentation in authentic and popular form, with extensive illustrations, of the broad pattern of Canadian life and its industrial, physical, and cultural foundations.

CONTENTS

MAY 1960

VOLUME LX

NUMBER 5

COVER SUBJECT:—*A section of western prairie in July.*

THEY ARE CHANGING THE FACE
OF SASKATCHEWAN 154
by PHYLLIS MACNEILL

BRITISH COLUMBIA LAKES (Pictorial) 172
by DONOVAN CLEMON

FOSSIL DISCOVERY IN PERU 176
by HELEN BUSH

THE MORAVIAN MISSION IN LABRADOR 182
by F. W. PEACOCK

EDITOR'S NOTE BOOK V

AMONGST THE NEW BOOKS V

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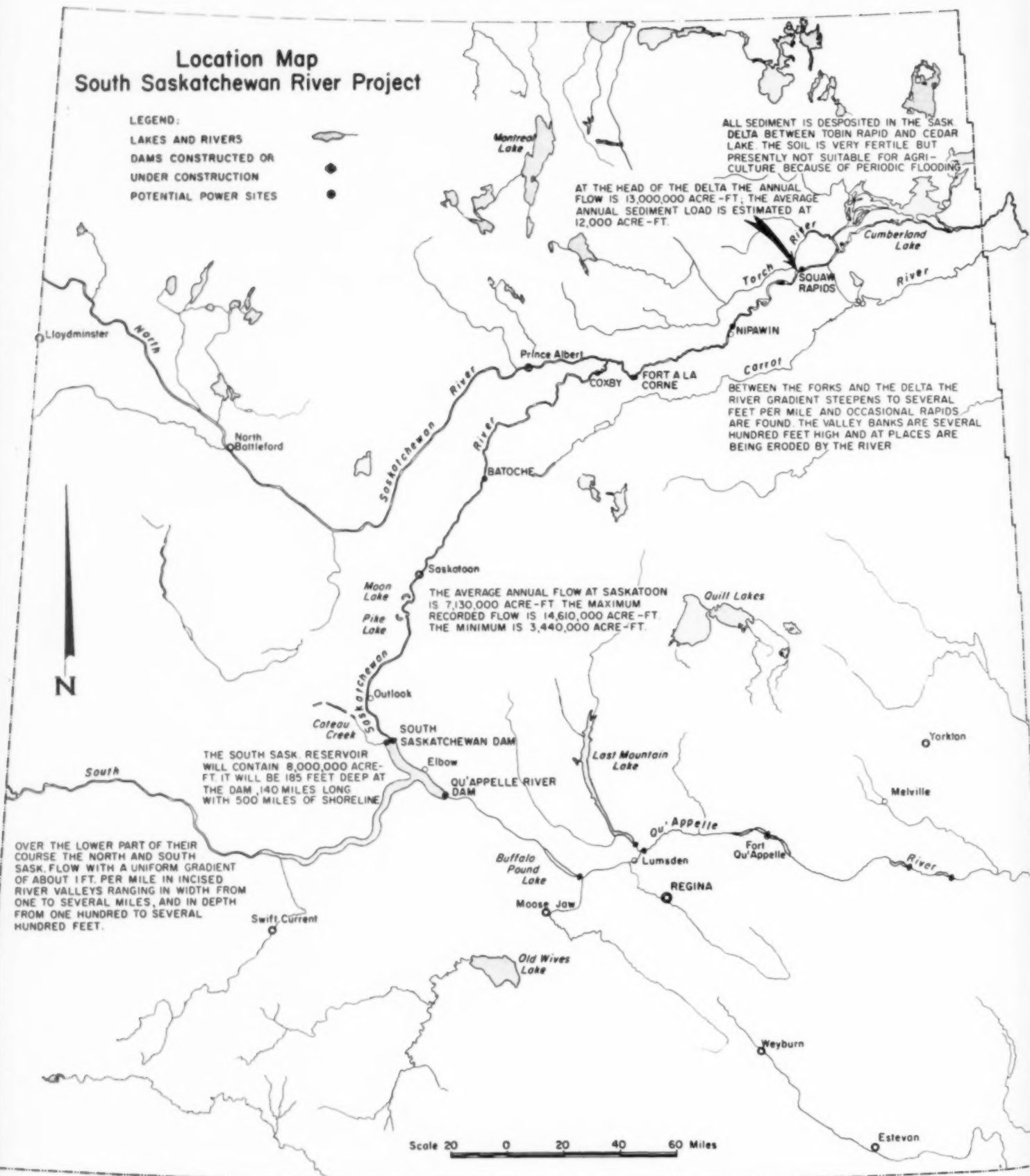
SPECIAL REPRESENTATIVES:

GEORGE F. HENDERSON Europe: S/L W. H. CORKILL, M.B.E.,
1103 Mayor Bldg., Montreal 2 The Mead, West Dumpton Lane,
(Tel. VI. 9-3571 or UN. 6-5285) Ramsgate, Kent, England.
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Location Map South Saskatchewan River Project

LEGEND:
LAKES AND RIVERS
DAMS CONSTRUCTED OR
UNDER CONSTRUCTION
POTENTIAL POWER SITES



PREPARED BY SURVEYS BRANCH DNR

They Are Changing The Face of Saskatchewan

by PHYLLIS MacNEILL

THE Indians called the river Kis-is-ska-tche-wan, the swift flowing, and so the province became Saskatchewan, land of the rapid river. It is well named. In the early days of the west this river was a highway into the hinterland for fur traders and voyageurs. Today, as in the past, the destiny of the province is closely linked to the future of this mighty water-way.

Since the first influx of farmers, Saskatchewan has periodically watched agriculture, its largest industry, suffer the ravages of drought while through the centre of the arid region the river rolled northward to waste its precious water in the vast expanse of Hudson Bay. This extravagance is soon to cease. Mighty machines are now at work night and day moving tons of earth into the valley to build one of the world's largest earthen dams. Within a few years the flood waters of the swift river will remain on the prairies to provide a new water resource for a thirsty province.

This is a project that will surely change the face of Saskatchewan. The main dam, north of the elbow on the South Saskatchewan River, will rise 210 feet above the river floor and stretch three miles across the valley. The secondary dam at the summit between the South Saskatchewan and Qu'Appelle River basins will be 90 feet in height and about two miles long. Eight million acre-feet of water will be impounded in a new lake stretching 140 miles south and west almost to the Alberta border. Along its 475 miles of shoreline parks will flourish providing new playgrounds for vacationers. New and more abundant crops grown on the 500,000 acres to be irrigated will stabilize the agricultural industry over a wide area of the province. New industries will appear utilizing water from the reservoir and power from new hydro-electric installations. Towns and cities will expand to serve the growing population of the area. Urban centres in southern Saskat-

chewan will have virtually unlimited water supplies for the first time in history. Downstream from the new dam floods will be controlled, river flow maintained, and power sites improved. Throughout the province the waters of the river will give new impetus to economic and industrial development.

The Historical Setting

The dream of a dam on the South Saskatchewan is over a hundred years old. In 1857, the British Colonial Office sent an expedition into western Canada under the direction of Captain John Palliser of the Waterford Artillery Militia. The following year, the the government of the Province of Canada placed Professor H. Y. Hind of Trinity College, Toronto, in charge of an expedition to explore and determine the agricultural possibilities of the Assiniboine and Saskatchewan River valleys. Their reports were similar in many respects. Palliser described an area triangular in shape bounded by Lethbridge, Estevan and Macklin (near the Saskatchewan-Alberta border) as a desert unfit for human habitation. Hind defined a smaller area within Palliser's triangle as true desert, including some 15 million acres in southern Saskatchewan and Alberta. Hind proved a good prophet. This region was the last part of the west to be settled, and during the droughts of 1918-22 and the 1930s thousands of farms were abandoned as settlers left the region in a mass exodus. Both Palliser and Hind also noted the interrelationship between the valleys of the Saskatchewan and the Qu'Appelle. Palliser speculated on the feasibility of a water communication system connecting the two. Hind went further and proposed the construction of a dam at the elbow of the river, a dam 85 feet high and 800 yards long. Hind's plan was to divert the flow of the South Saskatchewan into the Qu'Appelle, creating a water-way for navigation from Winnipeg to the Rockies.



Construction on the South Saskatchewan dam as seen looking south from the provincial picnic site on the river bank.

Saskatchewan Photo Services

The second request for a dam on the South Saskatchewan came soon after the province was settled, but this time the object was an assured source of water for expanding urban communities. It was proposed that a dam be built and that 100 million gallons of water per day be diverted into Buffalo Pound Lake in the Qu'Appelle Valley. From the lake the water would be pumped through pipelines to cities and towns in southern Saskatchewan. In 1912 the city of Regina actually obtained certain rights to the use of water from the river and in 1913 the provincial government established the Saskatchewan Water Commission to conduct an inquiry into the feasibility of the project. The Commission brought in its report in 1916 but the project proved too expensive and was dropped.

Only three years later, in 1919, a delegation petitioned the provincial government to construct a dam on the South Saskatchewan for irrigation purposes. This request was to be repeated again and again during the next twenty-five years.

It soon became evident that a project of this size was beyond the financial capabilities of the province. During the drought and depression of the 1930s, those who promoted a multi-purpose South Saskatchewan project turned their attention to the federal government with demands for assistance. They sought a Royal Commission to investigate the feasibility of the project.

In 1935, the Canadian government recognized the need for federal participation in the study and development of prairie water resources and established the Prairie Farm Rehabilitation Administration. The P.F.R.A. began a comprehensive investigation of the South Saskatchewan project in 1943, and during the next nine years completed a series of reports on every aspect of the proposed project.

However, the federal government was reluctant to proceed, stating that it was not convinced that the benefits of the project were commensurate with the cost or that the project represented the best use of the

physical resources involved. A Royal Commission was established to assess the project. Saskatchewan looked forward to a favourable report and an early start of construction, but in 1952 these hopes were shattered. The Royal Commission recommended against the project, stating that it was not in the national interest at that time.

The people of Saskatchewan were not convinced. There was continued pressure on the federal government from the groups and organizations, from Saskatchewan members of parliament and from the provincial C.C.F. government which had long been committed to construction of the dam. In the 1957 federal election the Progressive Conservatives proposed construction of the South Saskatchewan River Project as a major item in their election programme. Negotiations between the federal and provincial governments continued for about a year after the election and the final agreement was signed in July, 1958.

A Joint Federal-Provincial Project

The agreement provides that the federal government will acquire the necessary lands and will design and construct the reservoir, including the two dams and related works. The relocation of highways and other public works in the area to be flooded will be carried out by the province under a supplementary agreement yet to be negotiated. The cost of reservoir construction will be apportioned, 75 per cent to the federal government and 25

per cent, up to a maximum of \$25 million, to the provincial government.

The province is solely responsible for the planning and development of the benefit phases of the project including irrigation, power, recreation, water supply and flood control. No time limit has been placed on this development except that 50,000 acres must be ready for irrigation when the reservoir is completed. The federal contribution to the benefit phases is limited to 25 per cent of the cost of penstocks required for a generating capacity of 200,000 h.p.

The cost of the main reservoir, and the power and irrigation facilities is estimated to be between \$164 million and \$192 million.

When the reservoir is completed title to the lands and works will be transferred to the province which will assume immediate responsibility for operation. The federal government will remain responsible for reservoir maintenance for a period of ten years, sharing maintenance costs equally with the province during the last four years.

The federal government designated the P.F.R.A. as the agency to carry out its responsibilities under the agreement.

The province's administrative structure is more complex since it is concerned with all aspects of the project. The organization established must meet several needs. Policies and plans for each benefit phase of the project must be developed; planning and construction must be co-ordinated among three levels

Participants in the ceremonies officially launching the South Saskatchewan Project on May 27, 1959, including, left to right: G. L. MacKenzie, P.F.R.A. director; Premier T. C. Douglas; Dr. W. B. Tufts, president of the South Saskatchewan River Development Association; Prime Minister J. G. Diefenbaker; and federal Minister of Agriculture D. S. Harkness.

Saskatchewan Photo Services



of government; approved plans must be implemented, and the reservoir must be operated and eventually maintained.

The province attempted to convey an organization which would achieve these needs with minimum disruption and duplication of the present administrative framework. Existing agencies like the Department of Agriculture and the Saskatchewan Power Corporation are responsible for the origination and implementation of plans for each phase of the project. However, all plans and programme must be approved and co-ordinated by a new semi-independent agency, the South Saskatchewan River Development Commission. The Commission must effect full co-ordination of activities within the provincial administration and among the three levels of government. It has exclusive jurisdiction over the allocation, use and charges for reservoir water, and will be responsible for the maintenance and operation of the reservoir.

Canada's Largest Rolled Earth Dam

The site for the South Saskatchewan dam, 18 miles up-stream from Outlook, was selected on the basis of topography and location of materials. Foundation conditions dictate that

the dam be of rolled earth construction. A structure as high as a seventeen-storey building and nearly three miles long, it will be the largest dam of its kind in Canada and one of the largest in the world. Forty-five million cubic yards of earth will be used to build the embankment; the cement needed would fill 3,000 freight cars. Trains could pass with ease through any of the five diversion tunnels. During the eight-year construction period a labour force exceeding 1,500 men will be employed.

The dam will be 3,800 feet wide at the base. In cross-section the main embankment will be triangular, 2,600 feet across at the base and 60 feet in width at the top with slopes on both sides varying from 7 degrees at the bottom to 26 degrees at the top. An earth blanket varying in thickness from 10 to about 34 feet will extend beneath the reservoir 1,200 feet up-stream from the heel of the embankment to prevent water leaking under the structure. The upper 40 feet of the up-stream face of the dam will be covered with riprap for protection against wave action.

While the main fill is under construction, water from the river will be diverted through



Artist's conception of the South Saskatchewan dam when completed. P.F.R.A.

five reinforced concrete tunnels, each 20 feet in diameter and stretching about 4,050 feet through the west embankment of the dam. When the dam is completed three of the tunnels will be used to deliver water to turbines in the power station at the down-stream toe of the dam.

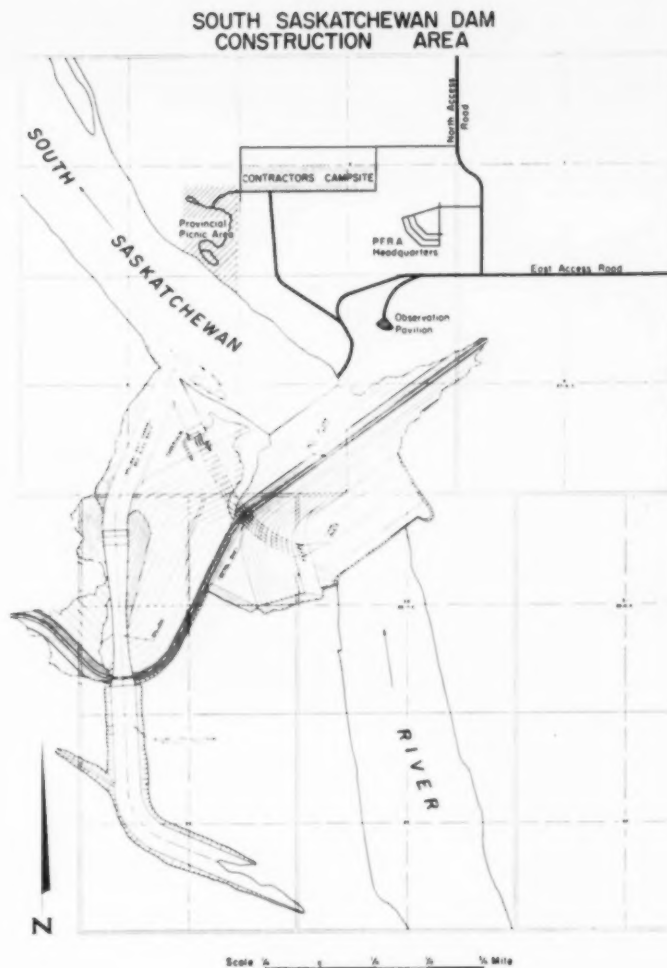
A reinforced concrete spillway to be built about one mile south-west of the main fill will utilize a natural depression created by the Coteau Creek, a small tributary which flows into the river just below the dam. The spillway will be 17,000 feet long and will have a discharge capacity of 265,000 cubic feet per second.

The Qu'Appelle dam, a rolled earth structure 90 feet high, 9,000 feet long and 700 feet wide at the base, will be built at the divide between the South Saskatchewan and the Qu'Appelle drainage basins at the head of Aikto Creek. It will prevent the waters of the reservoir from escaping down the Qu'Appelle Valley, thus creating Hind's water-way to Winnipeg, and will permit controlled diversion into the Qu'Appelle system for municipal water supply, recreation and other purposes.

When the reservoir is full, 109,600 acres will be flooded. Most of this area is immediately adjacent to the river and of little agricultural value except for grazing; only 5.2 per cent is now under cultivation.

Building the Reservoir

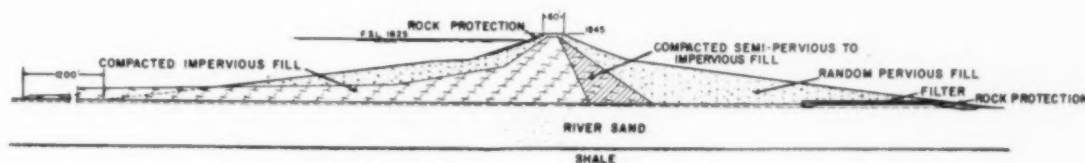
During the first year of construction, 1958-9, P.F.R.A.'s work on the reservoir was devoted mainly to getting the project operative. Access roads were constructed east and north from the dam site, and a headquarters community was established. Thirty-eight fully modern homes have been completed for families of P.F.R.A.'s supervisory staff, and five main headquarters buildings have been constructed: an engineering administration building, a soils mechanics laboratory, a machinery maintenance building, a community hall, and a staff house for single personnel. North of the community a large area serviced



with roads, sewer and water, has been set aside for contractors to erect facilities to house their single personnel.

In late 1958, construction began on the dam itself. Awards have been made on tenders called for eight major contracts including those for the construction bridge, the first stages of the main embankment, the processing of concrete aggregates, and the first stage of tunnel construction.

By the summer of 1959, work was under way on Stages I and II, the east and west embankments, under two contracts valued at nearly \$10 million. Work on both contracts involves the removal from the construction area of undesirable overburden material and the placement of selected fill material to raise the embankments to one-half their final height. Stage II is a somewhat larger contract than Stage I and involves the con-



Cross sectional plan of the South Saskatchewan River dam.



P.F.R.A. construction headquarters at the South Saskatchewan River dam site. The community includes 38 permanent homes and five main headquarters buildings.

P.F.R.A.

struction of the embankment on the west side to a point about midway across the river-bed. During the first stages of construction, the river will flow through an 800-foot channel separating the east and west embankments, and access across the channel will be provided by the construction bridge. Both contracts are scheduled for completion in late 1961.

A part of the west embankment contract involves the excavation of material overlying the entry and exit portals of the diversion tunnels. When the down-stream portals have been cleared early in 1960, work on the first stage of tunnel construction will begin. This will involve the excavation of five diversion tunnels from the down-stream portals to the control shaft, the installation of prefabricated steel ring beams for support, the placement of a three-foot thick reinforced concrete lining, and the installation of a steel lining for penstocks in three of the tunnels. The construction of the tunnels from the upstream portal to the control shaft, and the construction of the control shaft itself will follow and proceed along with the down-stream work. The P.F.R.A. hopes to have this phase of the work completed by the spring of 1963.

Stage III of the work, involving the excavation of the spillway and the construction of the Coteau embankment, will begin in 1960 and is scheduled for completion up to

one-half its final height by December 1961.

The most dramatic event in the construction of a large dam is the river diversion. This will form a later stage of the work. Following the June flood in 1963, the channel between the east and west embankments will be filled and the river flow diverted through the completed tunnels. This assumes that the work scheduled up to 1963 is completed and is not hampered by bad weather, shortages of materials, or "acts of God".

The construction of the Qu'Appelle dam, and highway and railway relocation will be phased into the overall programme in such a way as to avoid an abnormally high expenditure in any one year. At present it is expected that this work will begin in late 1962 and be completed by the fall of 1965.

If diversion can take place in the fall of 1963, the remaining work on the main dam will probably be completed by the fall of 1965. The tunnels will then be closed and reservoir filling will begin. A high spring flood in 1966 could fill the reservoir in one year and still permit the necessary minimum flow downstream. However, if the river flow is below average, it could take two or three years to fill the reservoir to minimum operating level.

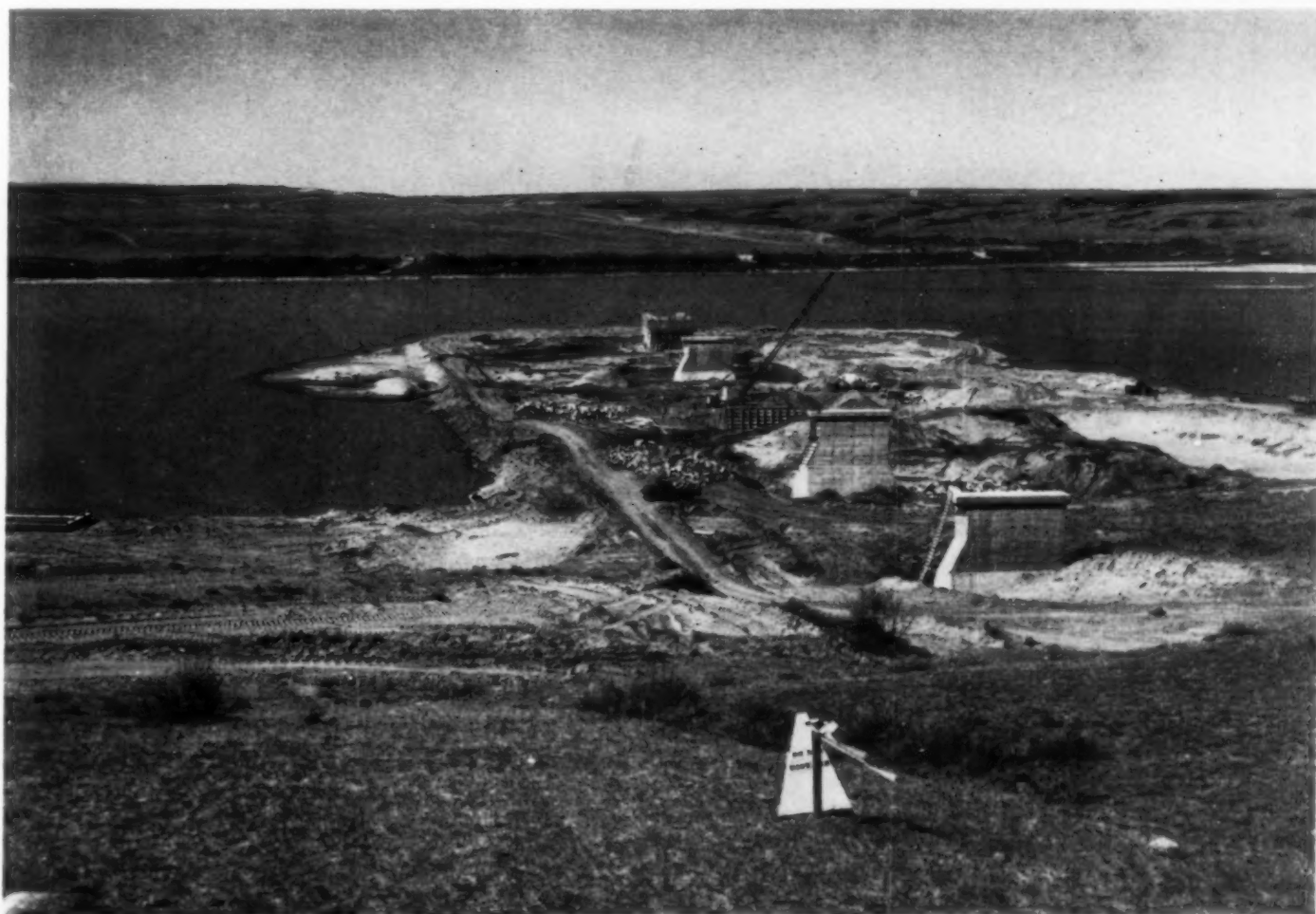
Although the construction activity has had a marked impact on the economy of the region, it has not resulted in the boom that many anticipated. Hundreds of applications have been received by local municipalities

from people wishing to establish temporary businesses along the access roads, but these developments have been severely curtailed. Early in 1958 the local municipalities, acting on the advice of the federal and provincial governments, agreed that land use controls would be enacted and enforced to prevent costly scattered development and to promote the sound, economic growth of the area. These controls have confined new development to three areas: a limited commercial zone and two industrial service zones near the construction site; a highway commercial zone at the junction of highway 19 and the east access road; and residential, commercial and industrial zones within or surrounding the existing trading centres. As a result of the foresight shown in the enactment of these controls, the problems associated with the provision of temporary housing, school, sanitary, health and other services have been kept to a minimum. The development that has taken place can be expected to conform with the pattern of the future development of the region.



Concrete aggregate sorting operations at the site of the South Saskatchewan dam. Note stockpiles of various sizes of aggregate material. One of the factors which determined the dam's location was the availability of suitable materials on the site. P.F.R.A.

Construction of piers for the bridge during the summer of 1959. P.F.R.A.





Aerial photograph of the construction area at the site of South Saskatchewan River Project looking south, September, 1959. Note P.F.R.A. construction headquarters (lower left) and Coteau Creek (centre right).

P.F.R.A.

Aerial view of construction area later in the same month, looking south. Note dyke jutting from the east bank of the river to prevent water erosion during spring run-off in 1960.

P.F.R.A.



A Multi-Purpose Project

By 1966, a great new water resource will have been created in an area that has long suffered from recurring drought. The economic and social benefits of the project, direct, indirect and intangible, will develop gradually over a period of several decades. The ultimate impact of the project on the province is a matter of speculation at present. But one thing is certain, through irrigation, power, water supply, recreation and flood control, the South Saskatchewan Project will give this province the greatest economic boost experienced in its short history.

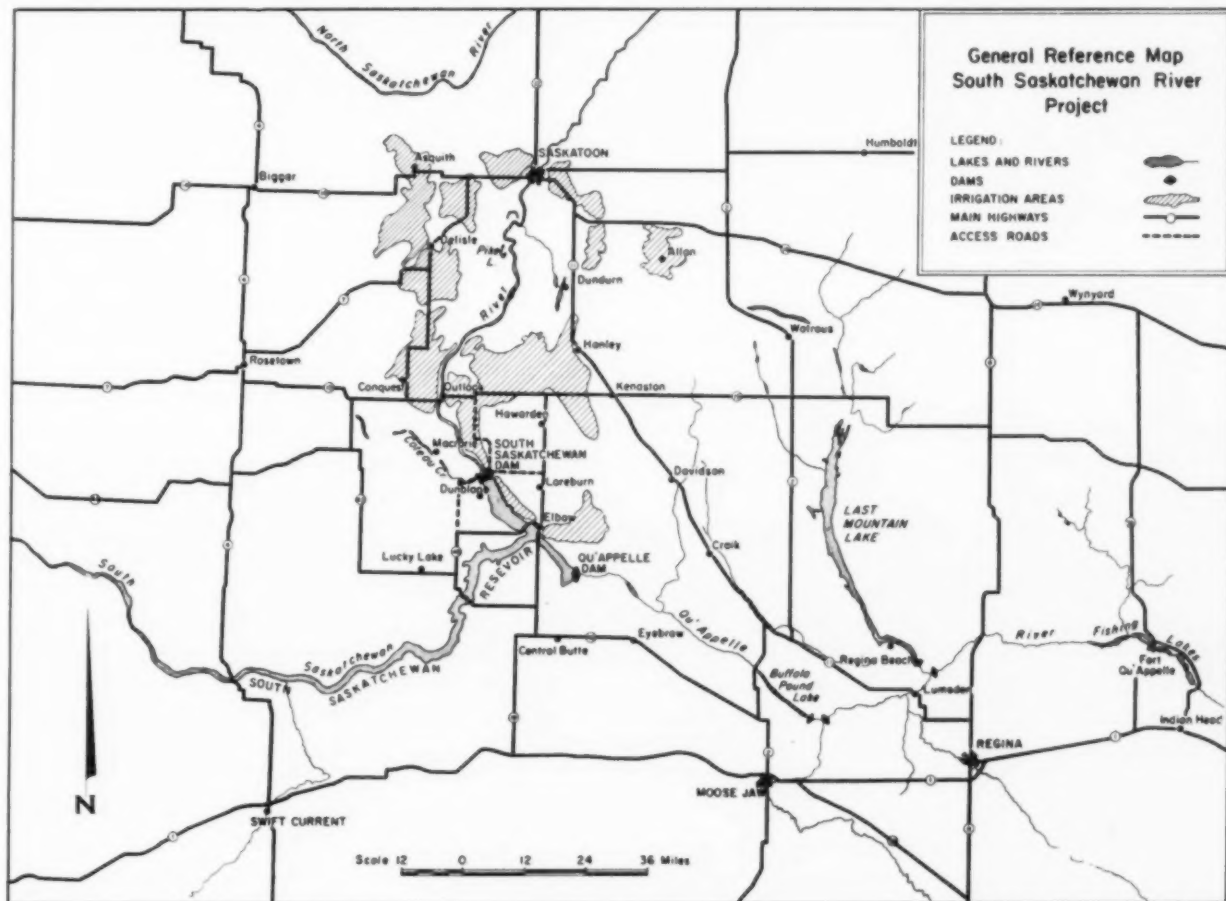
Irrigation

The main purpose of the project is irrigation — water to bring assured crop yields to a region of recurring drought. In 1949, the P.F.R.A. conducted a reconnaissance soil and topographic survey and tentatively located over 450,000 acres of land that could be ir-

rigated from the reservoir. This land is found in blocks on both sides of the South Saskatchewan River extending from the elbow to the vicinity of Saskatoon. In addition, an irrigable area of about 24,000 acres exists in the Qu'Appelle Valley. As the first step in launching this phase of the project, the province has agreed to have facilities for the irrigation of 50,000 acres ready when the reservoir is completed.

The selection of this acreage will be determined partly on the results of an irrigable land classification now being prepared, and partly by the attitudes of the farmers concerned.

Work on the irrigable land classification is proceeding rapidly. During the summer of 1959, the provincial Department of Agriculture, with the assistance of the soils and farm management departments of the University of Saskatchewan, the federal economics division and the P.F.R.A. drainage laboratory,





Border dyke irrigation on the prairies.

P.F.R.A.



Irrigating a field of potatoes in the Peace Valley.

undertook surveys on topography, soils, sub-surface drainage and land use throughout the potentially irrigable area. Topographic surveys provide data from which the costs of land levelling and distribution systems can be calculated. The soil and sub-surface drainage surveys indicate the suitability of land for irrigation — soil fertility, texture, chemical content and ability to permit infiltration of water. Land use surveys provide a picture of the present pattern of land use and economic data on existing farm operations. Engineers, soil experts, economists and agronomists will integrate the data, and prepare several classifications of irrigable land based upon combinations of soil, drainage, and topographic characteristics.

The productivity of each classification will be determined using yield data from other projects. Sample farm budgets will then be prepared to estimate the increase in net income on each classification of land under irrigation. Certain critical economic assumptions that have to be made in preparing these budgets will be determined by other studies undertaken to determine the optimum investment in irrigation, the best type of integration with dry-land farming, land policy, credit requirements and the costs of operation and maintenance.

Several possibilities in developing the irrigation system are also under investigation. Instead of constructing large expensive canals, it may be feasible to pump water directly from the reservoir and from the river downstream of the dam, using low-cost off-peak electric power.

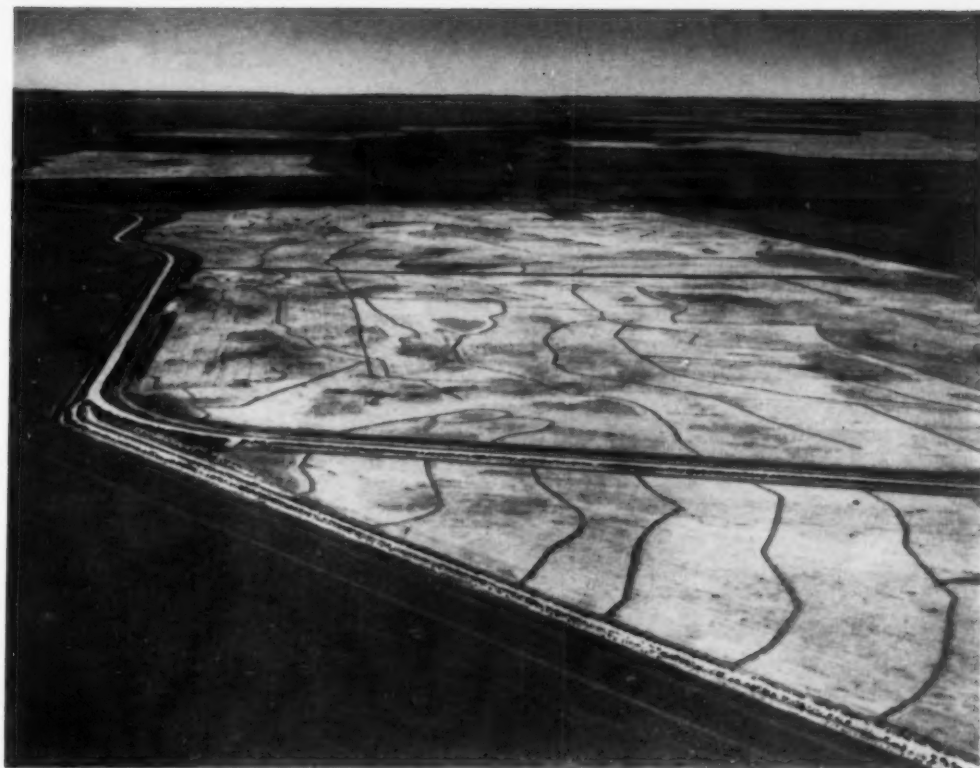
The surveys and investigations completed to date indicate that significant changes will be made in the boundaries of the areas originally classified as irrigable. New areas have been proposed, others have been enlarged, reduced, classed as doubtful, or eliminated.

In the final analysis, government spokesmen are agreed that the skill and enthusiasm of the irrigation farmer will determine the success of irrigation. Economic, agronomic and engineering factors being equal, the selection of areas for initial development will be made largely on the basis of the attitudes of the farmers concerned. An extension programme will be undertaken to outline the results of the investigations to the farmers in the area, and it would be premature to assess their reactions until this programme is completed.

However, it is clear that, at the present time, many farmers are seriously concerned, some fearing a repetition of problems encountered on earlier projects in Alberta and



s in the Peace Valley, using the sprinkler system
P.F.R.A.



Contour irrigation patterns. Note comparison between dry land features (left) and irrigated land (right).
P.F.R.A.

elsewhere, other apprehensive about the prospect of a radical change in their methods of operation and management. In the process of selecting the acreage and planning its development, the province hopes to anticipate and either avoid or solve the problems met on other projects in the past.

A new research and demonstration irrigation unit has been established by the provincial government at the University of Saskatchewan. This 250-acre project will be used to train irrigation experts, to give farmers a thorough knowledge of irrigation techniques, and to develop advanced methods of water application and land use. The project, which was opened in 1959, is a part of the university and is already being used by university students. Short courses for irrigation farmers will begin in 1960. Two research projects concerning water control and the mechanization of water application are now under way and other research projects are planned in the fields of livestock and fodder production, soils and fertilizers, crop rotation, weed control, the production of specialty crops and the development of new crop varieties. This work will complement that at the Outlook pre-development farm where crop rotation and livestock production experiments have been under way since 1950.

The Change in Agriculture

Since it will take at least a generation to develop the full irrigable potential of the South Saskatchewan River Project, the final impact on farming in the area is necessarily somewhat speculative in 1960. The transition from dry-land to irrigation farming will be gradual, with most farmers bringing additional acreage under the ditch each year until the complete change is made. The first real effect may not be felt for fifteen years and full development may take as long as twenty-five years. However, if one could look twenty-five years into the future, these are the changes he would probably find.

There will be more farms and they will be smaller. When all of the acreage has been brought under the ditch, more than 1,000 dry-land farms will have become about 2,000 irrigated farms. However, these farms will be larger than most irrigated farms in other projects of today and yesterday. A few years ago a farm of 160 acres with 100 to 140 acres irrigable was considered the maximum size for a family unit. The advances in irrigation technology over the past few years should make it possible to increase the size of farms on this project to about a half section with 200 to 250 acres irrigable.

The irrigation farmer will enjoy a higher



These two pictures demonstrate the effect of irrigation on crops grown along the South Saskatchewan River. A crop of oats on the left is from the non-irrigated portion of the project at Saskatoon and half of it irrigated twice while the other half received only natural moisture. Standing in the field on the right is J. F. Kinzel, director of information for the provincial department of agriculture. To the left is Mrs. Phyllis MacNeill; right, J. F. Kinzel, chairman of the South Saskatchewan River Development Commission and head of the department of agriculture.

income than does the dry-land farmer and this income will be assured. Production per acre is expected to double or triple. Although more intensive agriculture will also mean higher costs per acre, with full development of the irrigation system the costs of operation should be more than offset by increased income.

The large irrigation farmer in Saskatchewan

will probably continue to grow wheat, oats, barley and flax and will also diversify to produce forage crops, beef cattle and dairy products. A typical rotation during the initial stages of irrigation may have one-third to one-half of the land in grain and the remainder in hay or pasture crops. One acre of irrigated pasture will support one or two cattle and should produce about 600 pounds of beef

Irrigated potato crop at the Pre-Development Farm at Outlook. Note baled alfalfa in the background.

P.F.R.A.



Baled alfalfa on a field of irrigated Saskatchewan. Production will be an immediate benefit to the farmer.





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g in the ated field are: Dr. C. D.
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Saskatchewan Photo Services

per season; or one acre should yield two or three tons of hay, enough to carry one animal through the winter. Farmers will probably finish their cattle on course grains and fodder produced on their own land.

As the project matures, specialty crops may be introduced but this development is uncertain. Specialty crops will depend on the growth of markets in Saskatchewan's major

irrigated Saskatchewan. Increased fodder pro-
e beneficia from the South Saskatchewan
P.F.R.A.



The federal government's Pre-Development Farm at Outlook. Since 1950 the farm has been conducting irrigation experiments and demonstrat-
ing irrigation techniques to farmers.

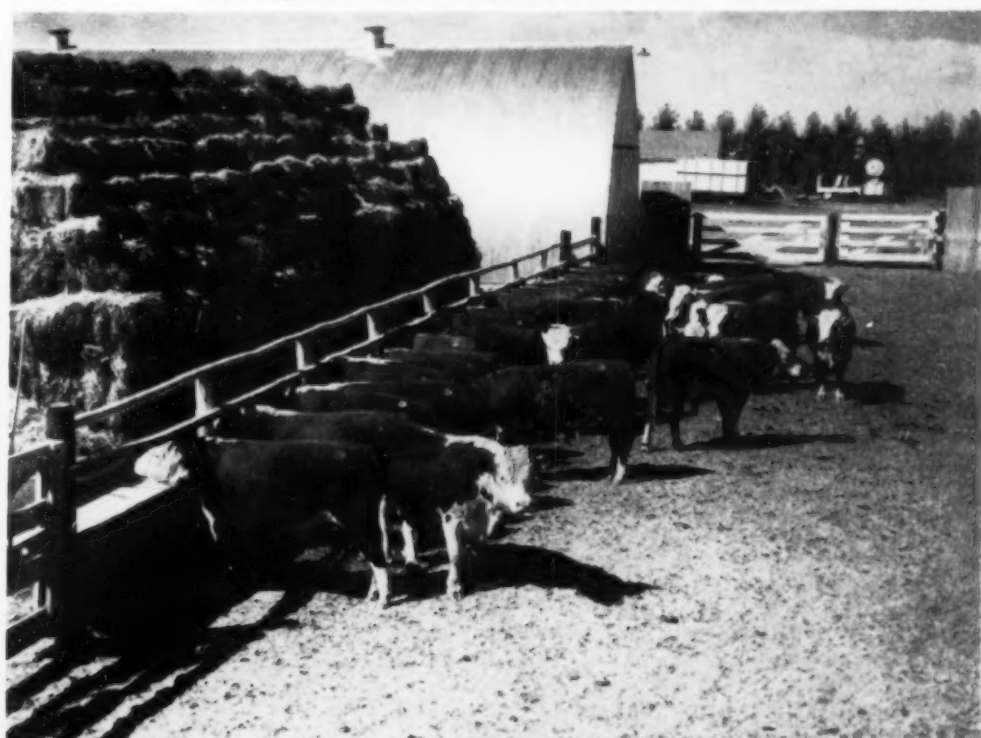
P.F.R.A.

cities and the availability of capital for processing plants and specialized farm equipment.

Smaller farms and more intensive agricultural methods will mean an increase in the population of the irrigated area, and this increase will be augmented by groups providing business, commercial and other services.

Direct benefits will be felt not only in the

Stabilization of Saskatchewan's livestock industry through increased fodder production will be one of the most immediate benefits of irrigation from the South Saskatchewan Project. This is the feedlot at the federal government's Pre-Development Farm at Outlook. P.F.R.A.



irrigable area itself but also over a wide area of central Saskatchewan. An immediate result of irrigation will be stabilization of the province's livestock industry through guaranteed supplies of fodder. Winter feed for livestock has always been a major problem in Saskatchewan and supplies of fodder are frequently imported from other provinces at great cost to the provincial treasury and to the industry. Fodder grown on lands irrigated from the new reservoir should be sufficient to supply the agricultural industry throughout a large part of the province, permitting farmers to diversify and stabilize their operations.

Hydro-electric Power

The importance of power to Saskatchewan's rapid economic and industrial expansion is reflected in the fact that the province's requirements for electrical energy are doubling every four years. At present, this power is generated exclusively in thermal stations. The construction of new hydro stations and their integration with the existing system of the Saskatchewan Power Corporation will permit great flexibility of operation and the generation of base and peak power from the most economical plants.

The initial capacity of the power installation at the South Saskatchewan dam will be approximately 225,000 kilowatts. Three of the five diversion tunnels will be lined with steel penstocks to convey water from the reservoir to three giant turbines in the power house. Construction of the power works is expected to begin shortly after river diversion in the fall of 1963, and to be completed when the reservoir reaches minimum operating level. The facilities will generate in excess of 500 million kilowatt-hours annually, depending on river flows.

The power plant at the dam will probably be integrated into the Saskatchewan Power Corporation system as a peak-load plant, with existing thermal stations carrying the base load. The huge capacity of the reservoir will permit water to be stored until it is required during the winter months to generate large blocks of power over short peak periods. As the peaking requirements of the system grow additional generating capacity may be added.

Though the hydro development at the dam is important, perhaps a more significant benefit of the project is its effect on the potential of power sites down-stream, particularly at Squaw Rapids, Nipawin, and Fort-a-la-Corne. Together they have six times the energy potential of the South Saskatchewan dam. However, very little storage is available at Nipawin and la Corne, and the development of these sites depends on river control and regulation through storage provided by the South Saskatchewan Project.

Development is already under way at the Squaw Rapids site where a dam across the river will provide 500,000 acre-feet of live storage, and permit an installed capacity of 201,000 kilowatts. The plant will generate about 1,000 million kilowatt-hours in an average year, more than twice the power to be produced at the site of the South Saskatchewan dam. Initial generation will begin in 1963, and additional units will be installed in 1964 and 1965. However, full potential of the project will not be realized until the South Saskatchewan reservoir is completed.

Recreation

The development of the reservoir for recreation will directly affect more people than either irrigation or power. The immense lake to be created by the dam will have a shoreline of 475 miles and will stretch from the centre of Saskatchewan almost to Alberta. Since recreation sites in this area are few and badly overcrowded, the new lake is certain to become one of Saskatchewan's largest playgrounds. Careful planning and controlled development should make it a major beauty spot in western Canada.

Last fall and winter a recreation consultant was engaged by the province to conduct a detailed survey of the reservoir shoreline. Preliminary reports indicate that the survey revealed suitable sites for provincial, regional and municipal parks, waterfowl sanctuaries, wildlife preserves and camp sites. The consultant's report is expected in the spring of 1960 and will include an outline of the recreation resources of the reservoir, an assessment of their relationship to the needs of the province, and a master plan for their development. Lands around the reservoir have been

THEY ARE CHANGING THE FACE OF SASKATCHEWAN

or will be acquired by the Crown, and development will be controlled within the framework of the master plan.

It is apparent that if the reservoir is to be attractive for recreation extensive afforestation will be necessary. With this in mind the Department of Natural Resources is establishing a new nursery near Prince Albert, which, within three years, will be producing over two million seedlings annually. Seedlings for afforestation will also be obtained from the other nurseries in the province.

Early reports indicate that the lake will support an abundance of both commercial and game fish. For the hunter, both waterfowl and upland game birds will be found in large numbers. Indeed, thousands of waterfowl are expected to nest in the area, and the main migration routes which are presently west of the river will probably shift so that ducks and geese can take advantage of the new expanse of water. Experiences elsewhere indicate that irrigation will bring about an increase in the population of pheasant, a popular game bird in Saskatchewan.

The dam itself will become a major attraction and it is expected that approximately 2,500 sightseers will visit the project each week during the construction period. Facilities have been provided at the site so that these visitors can obtain a good view of the dam without disrupting construction or placing themselves in any danger. Just above the dam an observation point has been estab-

lished with parking facilities for 240 cars. A pavilion now under construction will house exhibits and working models of the project. A little farther down-stream a provincial picnic area with camp kitchens, tables, and running water commands an excellent panoramic view of the actual construction and of a wide expanse of the river.

The South Saskatchewan Project will also substantially improve several existing playgrounds in southern Saskatchewan. Diversion from the reservoir into the Qu'Appelle Valley will maintain water levels in Last Mountain Lake and the six lakes in the Qu'Appelle chain. Periodically the level of these lakes falls and various types of algae flourish, making the water unsuitable for swimming.

Urban Water Supply

To urban residents of southern Saskatchewan an adequate water supply will be one of the greatest benefits to be derived from the Saskatchewan Project. Southern cities and towns have been searching for an adequate water supply constantly since they were established. For the first time in history they will be assured of virtually unlimited water for domestic and industrial use.

Regina and Moose Jaw now obtain part of their water from Buffalo Pound Lake, the lake level being maintained by pumping from the South Saskatchewan River into a high-level canal which carries the water over the summit into the Qu'Appelle River. When the

The Saskatchewan Landing Bridge north of Swift Current on Highway 4 must be raised or relocated as a result of the South Saskatchewan Project. When the reservoir is filled a large part of this area will be flooded, and parks and picnic sites will probably be established.

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Eroded badlands in southwestern Saskatchewan. When the reservoir is filled, these hills are expected to crumble into the new lake leaving a long even shoreline.

Saskatchewan Photo Services

reservoir is completed it will be possible to maintain the lake level by gravity flow from outlet works in the Qu'Appelle dam. Alternatively, water for southern cities could be piped directly from the reservoir.

Throughout the southern and central area of the province small urban centres can also look forward to the convenience of modern water and sewer systems. In most cases at present the source of water is the town well and sanitary facilities are limited to an outdoor privy in each backyard. Although inadequate and inconvenient these have had to suffice where water supplies were limited. It is highly probable that towns close to the reservoir will take advantage of the available water to install modern facilities and pipe water from the new lake. The provincial government may offer some assistance in a municipal water and sewer programme, perhaps in the form of grants, loans or technical assistance.

Industrial Development

Industrial development came late to Saskatchewan. Before and during the Second World War agricultural products accounted for most of the province's output. But within the last fifteen years a resource and industrial boom has raised the proportion of non-agricultural production from less than one-third to about two-thirds of provincial production. The power, water supply and irrigation phases of the project will all contribute directly or indirectly to an acceleration of this industrial growth.

The province's current industrial expansion is based on resource development and a central position in the western market. The South Saskatchewan Project will add new power and water resources to these basic factors. Because industrial development is a cumulative type of growth, the ultimate effects of the project on industrial expansion are difficult to estimate. The direct effects of irrigation will probably take the form of expansion in the feed and meat-packing industries. When the irrigation phase of the project matures and specialty crops are grown on a large scale, processing and canning factories may be established.

Flood Control

A serious flood hazard exists at several points along the south and main branches of the Saskatchewan River. Floods may occur once, twice or several times a year and have three main sources: snowmelt on the plains in April, snowmelt in the mountains sometimes accompanied by heavy rains in June, and prolonged intensive rainfall anywhere in the drainage basin. The regulation permitted by the huge capacity of the reservoir will virtually eliminate flooding on the south branch down-stream from the dam, particularly in the Pike Lake area south of Saskatoon.

Floods on the main branch below the forks also will be greatly reduced. This is of special significance to the agriculturally rich Carrot River Valley and Saskatchewan delta region. The Saskatchewan delta is a gently sloping plain about 30 miles wide and 120 miles long.

THEY ARE CHANGING THE FACE OF SASKATCHEWAN

Most of the sediment carried by both branches of the river has been deposited here for ten thousand years as the course of the river changed frequently spreading the rich deposits of soil over a wide area. Settlement of the fertile delta land has not been possible because of periodic flooding and poor drainage. The reclamation of even part of this region could mean the development of a new farming area which would be of particular importance in the future as northern resources are developed and northern populations rise.

A Province Looks to the Future

The South Saskatchewan Project is the largest and most expensive enterprise ever undertaken by this province, and it is being undertaken at a time of high and rising costs. Estimates of \$118 million to be spent by the provincial government for the dam, irrigation works and initial power facilities represent only a part of the investment made necessary or generated by the project. The actual private and public investment in irrigation development, recreation facilities, water supply, flood control, and power installations at the site and down-stream may well amount to hundreds of millions of dollars over a period of years. This is a tremendous investment for

a province with a population of about 910,000 and an annual budget of less than \$150 millions.

The fact is that the benefits of the project are much needed in Saskatchewan. Without new water and power resources present rates of industrial growth cannot be maintained. The long-term agricultural outlook is not optimistic unless farmers can achieve the diversification and stability that irrigation will bring. So Saskatchewan is prepared to bet its economic shirt on the South Saskatchewan Project.

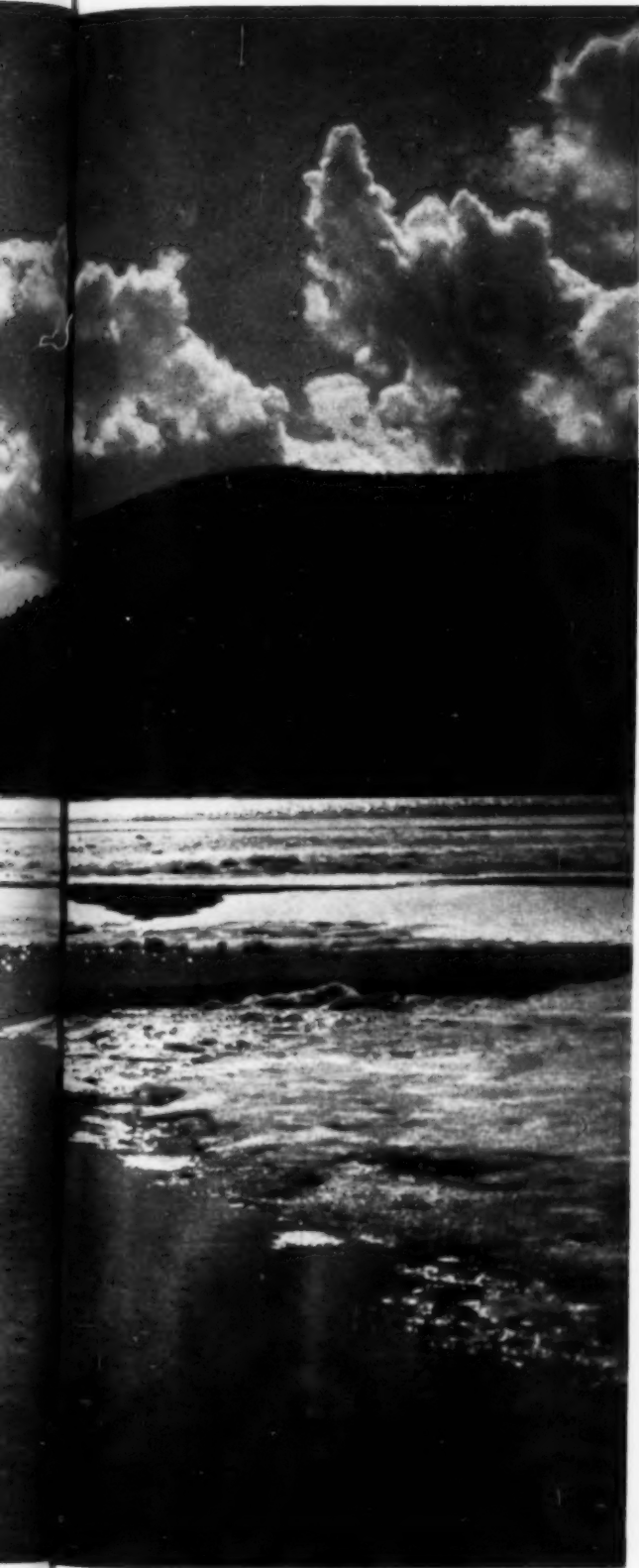
Most observers feel that the bet was inevitable and that it is virtually a sure thing. Saskatchewan expects its tremendous investment to be repaid many times over in agricultural stability, industrial expansion, and in a more attractive life for its people. Premier T. C. Douglas made this point when he spoke at the official start of construction in 1959. "The future of Saskatchewan", he said, "depends on our ability to diversify and stabilize our economy . . . The building of the South Saskatchewan River dam can be a turning point in Saskatchewan economic history. With its realization I feel confident that this province will move forward to the high destiny which we all believe lies ahead."

A potential park area in southwestern Saskatchewan. When the reservoir is filled, this part of the valley will become a part of the lake. Extensive afforestation is to begin shortly on many such sites.

Saskatchewan Photo Services







British Columbia Lakes

Photographs by DONOVAN CLEMSON

Spring on Mara Lake in the Shuswap country. The warm breezes drift the ice floes back and forth until they disintegrate. The lake is fed by Shuswap River and is a popular summer resort for Okanagan Valley residents.



168 square miles in extent, Kootenay Lake is one of the province's largest. Lying among 10,000 foot mountains, it is fed by rushing streams. A prominent feature is the large quantity of driftwood fringing the shore. This scene is at Lardeau near the head of the lake.



Slocan Lake is in the Kootenay country, at one time a busy mining district. Steamboats were then used to transport ore and supplies on the lake. The last of them, the Rosebery, here reposes, beached at New Denver.



Kamloops Lake, deep and narrow, lies in the Thompson Valley. On the opposite side are the bare hills of Copper Creek. This lake is on the annual Fraser sockeye salmon run to the Shuswap spawning beds.



Part of an exhibit resulting from the Peruvian expedition, now to be seen at the Royal Ontario Museum. Shown is a model of a sabre-toothed cat (left) and a giant sloth.

Fossil Discovery In Peru

by HELEN BUSH

Photographs by Royal Ontario Museum

ONE OF the most exciting fossil discoveries in many years was made by a recent Royal Ontario Museum expedition to Peru. Scientists recovered, from a prehistoric tar pit, some four tons of 50,000-year-old remains of an amazing variety of mammals, birds, reptiles, insects and plants, some of which have long been extinct.

Research on these finds will shed considerably more light on the life, climate and geography of the Pleistocene period, a time when glacial conditions prevailed over a good share of the earth. In the meantime, a dramatic series of exhibits set up in a gallery of the Royal Ontario Museum is already acquainting the public with the expedition's finds, and more exhibits will be added, as research continues and more material is cleaned, restored and identified.

The tar pit, currently used as a source of road material, was located on property owned by the International Petroleum Company, Limited. Both company officials and natives knew that the tar-soaked gravel contained bones, but until 1957, when two Canadian geologists, Dr. Hugh MacDonald and Mr. Robert Fraleigh, employed by the oil company, came upon the bones no one had realized that they were of prehistoric origin. Dr. MacDonald wrote to the Department of Palaeontology at the Royal Ontario Museum, and offered to send some specimens if the museum would be interested in having them. Dr. A. G. Edmund, curator of Vertebrate Palaeontology, accepted the offer at once.

When a 125-pound crate of specimens arrived, it was found to represent parts of many different kinds of animals and birds.

All bones were beautifully preserved and black as ebony from long burial in the tar. Evidently this Peruvian tar pit was similar to the one in Los Angeles, California, named Rancho La Brea (*brea* being Spanish for tar), which has been famous for nearly a hundred years for the abundance of its prehistoric remains. It was believed to be without parallel in the world since other tar occurrences in California had a lesser fossil content and those in Ecuador had not been given much publicity. The comparatively small parcel from Peru with its wide assemblage of remains, suggested a deposit well worth exploring.

Dr. Edmund asked that the part of the quarry containing the bones be closed until he and his associates could organize an expedition and fly in to investigate it. He chose his colleague, Dr. Roy Lemon, assistant curator of Invertebrate Palaeontology, as the second member of the expedition. The third member was Mr. Ralph R. Hornell, chief technician in Vertebrate Palaeontology and a veteran of 17 important expeditions.

Finances for the project were available from Museum funds and from Province of Ontario grants to the Museum, while the International Petroleum Company assisted the expedition in every possible way.

On January 15, 1958, Dr. Edmund, Dr. Lemon and Mr. Hornell arrived in Talara, company town of International Petroleum, only 14 miles distant from the tar pit. Once established in comfortable quarters, courtesy of the company, they set out to make a preliminary inspection of the occurrence. Fossil material was evident as soon as they entered the quarry, for scattered about on the surface were numerous bones, tossed aside by workmen. The source of the bones was a palaeontologist's paradise. Along a 60-foot front stretched a highly concentrated layer of bones, sometimes nearly two feet thick and with an overburden of a mere four feet or so.

The first task of the expedition was to acquire workmen and equipment. A bulldozer, rented for one day, removed most of the overburden. Eleven Peruvian labourers were then hired to clear away the remaining debris from the bone layer. For transporta-



Dr. Gordon Edmund, curator of Vertebrate Palaeontology at the Royal Ontario Museum and leader of the Museum's expedition to Peru, is shown working on the skull of a sabre-toothed cat.

On his return from Peru, Dr. Roy Lemon, curator of Invertebrate Palaeontology at the Royal Ontario Museum, studies his notes and maps of the La Brea fossil bone pit.





A bulldozer removes the four foot overburden from the fossil bone layer in the tar pit quarry.

tion to and from Talara, a truck was hired. Blowouts were a common occurrence and the springs eventually had to be replaced, which was not surprising since it was a $\frac{1}{2}$ -ton truck and its daily load consisted of several men with their equipment, plus the finds of the day.

When the bone layer was readily accessible, three of the labourers were trained to work with the scientists. They soon became adept in the careful use of small picks, scrapers and whisk brooms, and took great pride in retrieving specimens intact and undamaged.

Where the bones were buried in a mixture of soft tar and sand, they could be recovered fairly easily. More often, however, they were imbedded in a tough and brittle matrix resembling coke. In this case, whole blocks of material were removed, the blocks being about 4 ft. by 2 ft. by 1 ft. These were encased in the cheapest lumber available, beautiful 2-foot-wide mahogany boards, ready for shipment back to the Museum where they would be worked on later. The more fragile bones were encased in plaster bandages. The plaster itself posed a problem at first, since the local product was of very poor quality, but a supply of splint bandages was eventually secured from the hospital's stores and was used for this purpose.

Just as important as the larger bones of

mastodons and cats, were the small ones of animals such as mice and birds, and the delicate insect and plant remains. Tarry material containing these was put in baskets, taken to an oil refinery near Talara and dipped in hot kerosene for several days. This dissolved the tar, leaving behind gravel and fossils, which could be further sorted out by hand labour. One cubic yard of original matrix, after being soaked in kerosene, would be reduced to about one cubic foot of gravel and specimens, while final sorting might result in only a cigar box full of tiny bird and mammal bones and isolated small teeth.

Six weeks of steady work cleared out the deposit and yielded a wealth of prehistoric remains on which detailed and conclusive research will not be completed for several years. Included in the finds were the bones of the now extinct mastodon, sabre-tooth cat, a lion-like cat, giant sloth and armadillo-like glyptodon; of horses, which later became extinct in the Americas; of camels, small deer, wolves, foxes, skunks, lizards, crocodiles, turtles, bats, various rodents and at least 20 varieties of birds, some of which may survive today.

So well preserved were the bones that evidence of injury and disease was quite apparent in some cases. Fractures that had healed were observed in the bones of a wolf

After a bulldozer has removed most of the overburden, Peruvian labourers clear away the remaining debris from the fossil bone layer.



and two foxes. Several cases of osteomyelitis were observed in some wolf remains, while the spine of one sabre-tooth cat had obviously been subject to an arthritic disease. A small percentage of the bones were water worn, indicating that some animals had died elsewhere and that their bones were later carried into the tar by streams.

The remains in La Brea (as the pit has been named) were established as belonging to the upper part of the Pleistocene period, which occurred about 50,000 years ago. This also meant that they were contemporary with those of Rancho La Brea in Los Angeles, even though there were a few differences. For instance, glyptodon and crocodile bones have been recovered at La Brea, whereas none have ever turned up in the Los Angeles deposit. On the other hand, there has been no evidence of man, bison or mammoth in La Brea while human bones and artifacts have been unearthed in California.

How did it happen that such great numbers of creatures were trapped in the tar? Scientists believe that the viscous tar might have supported a thin veneer of vegetation, or been hidden under pools of water, either of which would have attracted animals on the prowl for food or drink. Once an animal had set foot in the treacherous tar, there would be no escape. Soon it would be engulfed entirely.

A Peruvian labourer is seen sorting small fossil bones from gravel.

Its cries of terror would lure others, particularly the carnivores and vultures, to prey on it and they in turn would be trapped. This drama could be enacted over and over again and, in an incredibly short time, the toll of victims could reach an impressive number. It was discovered that tar even in its





A model of a glyptodon in the Royal Ontario Museum exhibit.

fresh state could serve as a trap. As the surrounding area was being checked for further fossil bone deposits, a fresh tar pool was found in which a large flock of ducks and many insects had been trapped within recent weeks.

It is of interest to note the deductions which can be drawn as to the geography and climate of the past. First the palaeontologists considered the present. The fossil deposit was located on a coastal plain near the ocean and within sight of the foothills of the Andes. It was a desert area, arid and barren, except for a few scraggly thorn bushes, and it supported little vertebrate life. The temperature averaged about 95° Fahrenheit and rain fell only infrequently. While streams and rivers originated in the mountains, most of them evaporated long before they reached the ocean. Even the town of Talara piped in its water some 30 miles across the desert.

The fossils furnished information regarding the past. The large number of browsing animals such as the horse, camel, deer, mastodon and sloth indicated that a fair amount of vegetation must have been present. Turtles, crocodiles, longlegged wading birds and water beetles (some up to two inches in length) suggested the presence of both free running and pond water. Possibly this vegetation and water was in the form of an oasis, for the remains of thorn bushes similar to the modern ones showed that

desert conditions also must have existed.

As for life, although the elephant-like mastodon was obviously the largest creature of the times, the sabre-tooth cat with its two wicked stabbing canine teeth and its powerful limbs and shoulders, was no doubt the most ferocious, and the terror of all living things. One bit of fossil evidence puzzled the scientists for a time — some thorn bushes and twigs of other bushes were in exactly 1-inch lengths. A little detective work among the animal bones eventually turned up the fact that this would be exactly the bite size of one particular sloth.

The reason some of the animals had become extinct was not so apparent. The extinction of the same animals had been noted in many other parts of the world but the reason was no clearer at La Brea than elsewhere. Perhaps some were not efficient animals and therefore they were replaced by others; or disease may have wiped out some species. Certainly size, as in the mastodon, or brute force as displayed in the sabre-tooth cat, were not enough to insure survival. But as the cleaning, identifying and studying of the specimen material goes on, more answers may turn up.

And how does La Brea compare with the famous Rancho La Brea in California? La Brea has neither the size nor the abundance of remains, but it does compare favourably in the variety of its remains. Certainly, the two deposits point up the fact that both areas, though far apart, enjoyed similar climates and fostered similar flora and fauna.

Comparing the expedition itself with the many others in which he had taken part, Mr. Hornell stated that La Brea possessed the richest concentration of fossils he had ever seen and that it was the easiest to remove — also the dirtiest, since all resembled coal heavers at the day's end rather than men of science. As for the weather, although the temperature was high, it was offset by low humidity and a continuous breeze from the ocean. And never before had he enjoyed more luxurious headquarters, with good food and the other amenities of civilization. More often, tents situated in the middle of bleak areas, a monotonous diet and a scarcity of water were the lot of fossil hunters.

The palaeontologists also experienced a Peruvian pre-Lenten festival of three days duration, known as Carnavali, which somewhat resembled a prolonged April Fool's Day. Pushing unsuspecting people in swimming pools, dredging them with flour or soot or paint, or anything else handy, was the order of the day, as were the resulting fights. Standard equipment for all were water guns. Even the local priest was seen purchasing one. The scientists were warned that they would be fair game and to drive with their windows closed, or, better yet, to keep out of sight. Even so, they were awakened late one night by revellers pushing in their bedroom doors and dousing them with their water guns amid the gleeful explanation, "Carnavali! Carnavali!" Peruvian etiquette was very rigid in such cases — only a round of drinks would send the revellers on their way. Needless to say, extra pay was necessary to keep some of their workmen on the job during this festive time.

Two years have passed now and in spite of the countless drawers and cupboards that are fast filling up at the Royal Ontario Museum with shiny ebony bones, skulls, teeth and claws of all sizes, much remains to be done. Many plaster encased packages are

still unopened as are some of the mahogany cases (a speculative look comes into Dr. Edmund's eyes, as he looks at the mahogany, for he is an expert carpenter and one handsome mahogany table already graces his office). Results of the palaeontologists' research will be made available to their fellow scientists the world over through scientific publications; while more exhibits will be added to those already present in the Museum's galleries for the benefit of the public. Although no one skeleton was found in its original entirety, since all had fallen apart and were scattered at random, it is expected that there will be enough parts to reconstruct a sabre-tooth cat, a lion-like cat, a fox, wolf, duck and vulture. In grateful thanks to the Peruvian people, similar prepared exhibits will be sent to the museum in Lima.

The Royal Ontario Museum's expedition has made a significant contribution to knowledge of the late Pleistocene fauna in Peru; and their study collection, which shows in a remarkable way the association of so many different forms of life — mammals, birds, reptiles, insects and plants — will be the only one in Canada and probably the best in North America.

An exhibit of some of the fossil bones of the sabre-toothed cat at the Royal Ontario Museum. Eventually, a complete skeleton may be reconstructed.





View of Nain, Labrador, the headquarters of the Moravian Missions.

The Moravian Mission in Labrador

by F. W. PEACOCK

Photographs by the author except where credited

THE MORAVIAN missionaries first came to the Labrador Coast in the year 1752, two hundred and eight years ago; but he who would tell the story of the Moravian Mission in Labrador must make up his mind to start at the beginning. The beginning was in the year 1732 when the first Moravian missionaries were sent out from Herrnhut, in Saxony, to the island of St. Thomas in the West Indies. This event awakened in the hearts of the Moravians of Herrnhut a "passion for souls" which sent them out to remote places to proclaim the Gospel of Jesus Christ. Less than six months after the first missionaries had set out, a second party, consisting of three Brethren, was despatched to Greenland. There they arrived in the month of May and built their first house of stone and sod. Faced with great hardship these men willingly endured privation and sickness, and in time, progress was made. A Danish pilot, John Christian Erhardt, seeing the transformation made in the lives of the Green-

land Eskimos by the Gospel of Jesus Christ, besought the Moravians in Herrnhut to send missionaries to the ferocious, murderous, thieving Eskimos of Labrador in the hope that they too might be transformed by the power of the Gospel.

In 1752, three London merchants, Messrs. Nisbet, Bell and Grace, members of the Moravian Church in Fetter Lane, proposed fitting out a vessel to go to Labrador with a view to trade in oil and whalebone. They engaged the pilot Erhardt as supercargo, because of his acquaintance with the Northern Seas and his knowledge of the Eskimo language and methods of trading. Since they were also in sympathy with the suggested mission to the Labrador Eskimos they proposed that the Moravian Brethren should send out some of their number to explore the Coast, to learn the language, and to make a general investigation with a view to establishing a settlement.

Count Zinzendorf, the head of the Mora-

vian Church, was inclined to regard the plan with some degree of distrust, owing to its association with trade; nevertheless he was not disposed to hinder the project and when four Brethren, George Golkowsky, John Christian Krum, Frederick Post and Matthew Kunz, volunteered for the mission, their offer was accepted. The missionaries were given to understand that the expedition was strictly speaking one of investigation. Should therefore they eventually decide to stay on the Coast of Labrador, this was to be entirely of their own free will. With the possible prospect of settling there, at all events for a time, they decided to take with them a wooden house, ready to set up; a boat, some articles of furniture, and some seed for a kitchen garden. Erhardt was to act as the vice-captain of the vessel, and also as agent in the event of their being able to transact business with the Eskimos.

The exploring party embarked on May 18th, 1752. Contrary winds and dead calms impeded the progress of the *Hope*, and it was not until the 25th that Land's End was passed and the voyagers found themselves in the open sea. On June 28th, William Hendel, one of the sailors, fell while furling the top-sail and sustained such injuries that he died within a week. On July 4th, they sighted Belle Isle and the next day they saw the Coast of Labrador. On July 13th, they cast anchor in an inlet which was so full of cod that they named it Cod Bay. This is probably the inlet that is today called Sandwich Bay. Continuing their voyage on the 18th, the missionaries arrived the following day at the entrance to a large bay (probably Hamilton Inlet) where they were struck by the enormous flocks of wild fowl — geese, ducks and pigeons — which swarmed in the locality. As the land bordering this inlet was well wooded and appeared to be pasture land, they were at first disposed to settle there. However, the "pasture land", on closer investigation, proved to be only a deep coating of green moss beneath which lay loose rocks and stones; so the ship moved north. A little later they contacted Eskimos and carried on a brisk trade. Some time later they entered a small harbour which they named Nisbet's Harbour and here the missionaries decided

that they would set up their house. On August the 9th the foundation stone of the mission-house was laid and the work commended to the Lord in prayer. With the help of some of the sailors the house was erected and a plot cleared for a garden, but on August 31st hoarfrost warned the party that summer was nearing its end. Seeds had already been planted in the kitchen garden and shoots had appeared very quickly, but night frosts soon destroyed the young plants. By the beginning of September building operations were well advanced and so on September 4th a year's stock of food, two cannon and eight muskets were put ashore for the missionaries. The missionaries then signed a paper declaring that their action in settling on this inhospitable coast was entirely voluntary. The following days, letters to Europe were hastily written and entrusted to Erhardt for delivery. Farewells were said and the *Hope* spread her





View of the Labrador coast near Hebron.

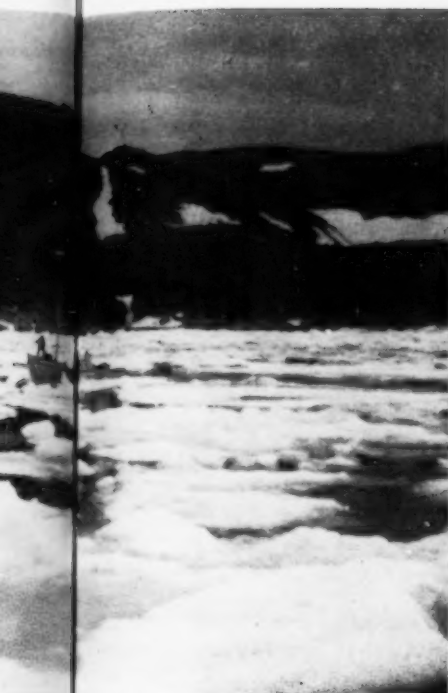


The harbour on early

sails and moved toward the open sea. The missionaries then began to explore the district with their guns and fishing tackle, in order that they might augment their supplies so that their stores would not be subjected to too great a strain, and they prepared to settle down for the coming winter.

Ten days later, on the evening of September 15th, the missionaries were greatly surprised to see the *Hope* coming into the bay in the gathering darkness. The missionaries had thought that by this time the *Hope* was far out into the Atlantic on her homeward voyage. A signal from the ship requested the missionaries to go aboard at once; this they were unable to do owing to a strong ebb-tide. The ship's crew were unable to go ashore as they had, apparently, no boat. Next morning as soon as the rising tide enabled them to launch their boat, the missionaries went aboard the vessel. They were told that after the *Hope* had left Nisbet's Harbour and had gained the open sea, those on board had seen a number of Eskimos in kayaks paddling toward them. On approaching, the Eskimos requested Erhardt to go further north, as a large party of their countrymen was anxious to do business with him. Erhardt wishing to make the expedition as successful as possible followed the kayaks until the *Hope* reached Davis Inlet. Here the schooner anchored and a brisk business was done. On the morning of the 11th, three Eskimos came aboard and asked Er-

hardt to land saying that more business could be transacted. It was claimed that some Eskimos were afraid of the ship's guns. A boat was lowered and Erhardt, his assistant Claude Hamilton, Captain Madgeson, the boatman Roberts, and three sailors, Elick, Wm. Losen and J. Nowell, headed toward shore. The schooner was left in charge of the mate Goff, the only one remaining on board who understood the management of the vessel. Very soon the ship's boat was lost to sight around one of the many islands in the neighbourhood. Goff waited patiently for the return of the party, but hour after hour passed and still there was no sign of them. For two days Goff waited in the ominous silence which was only broken by the occasional boom of a cannon discharged on board the schooner to indicate the direction of the vessel in case Erhardt and his companions had missed their way. The mate had no boat in which to send out a search party and so on the morning of the third day he decided to return to Nisbet's Harbour and report to the missionaries what had happened. The missionaries decided that they would go in their own boat to the fatal spot and investigate the matter more fully. High seas impeded their progress and the party was obliged to return. A consultation was held to decide what action should be taken. A week had elapsed and all hope for the safety of the missing men had been abandoned. The schooner's crew was now so



harbour in early spring.



An aerial view of Hopedale, Labrador. The wooded section is known as "The Park".

depleted that it was resolved that out of consideration for the owners of the vessel and also to insure that the home authorities were made acquainted with what had occurred, the missionaries should assist in manning the vessel on her homeward voyage; the missionaries intended to return the following year. The vessel proceeded to St. John's, after leaving some provisions should the missing party find its way to that spot. The ship arrived in London at the end of November. It was assumed that the party had been murdered by the Eskimos for the trade goods it had carried ashore. The four missionaries were destined never again to set foot on the rugged coast of Labrador.

The story now moves back to Herrnhut in Saxony where a young man, Jens Haven by name, visiting from his native Jutland, chanced to hear of the presumed death of Erhardt. Haven was twenty-eight years of age and a strong desire possessed him to go and preach the Gospel to Erhardt's murderers. Jens Haven had been a wild and wilful boy and, like Saul of Tarsus on the Damascus road, he had been stopped in his tracks by Jesus of Nazareth. In the year 1758 Haven received a call to Mission service — not in Labrador, but in Greenland. This was not what he had set his heart upon but after an interview with Count Zinzendorf he willingly accepted the call to serve in Greenland. He was becoming reconciled to the thought of

spending his life among the Greenland Eskimos; however one night he had a dream and he thought he heard a voice that told him that this was not his destiny but that he would preach the Gospel to a nation without knowledge of the Saviour. Since he was content in Greenland he drove the vision and the voice from his mind and fell asleep. But a second and a third time the same message came to him. In 1763 he returned to Europe on furlough and was preparing to set out a second time for Greenland. However, as was the custom among the Moravians of those days, the matter was put to the Lot and the Lot said "No". It was then that he made known his dreams to the Mission Board and was encouraged to follow "his Vision". Proceeding from Herrnhut to London in February 1764, he obtained the assistance and sympathy of Sir Hugh Palliser, then Governor of Newfoundland. He proceeded to St. John's, Newfoundland, and while awaiting the arrival of the Governor supported himself as a carpenter.

When the Governor arrived he issued the following proclamation:

Hitherto the Esquimaux have been considered in no other light than as thieves and murderers, but as Mr. Haven has formed the laudable plan, not only of uniting these people with the English nation, but of instructing them in the Christian religion, I require, by virtue of the powers delegated to me, that all men, whomsoever it may concern, lend him all the assistance in their power.



The three schools at Nain.

This proclamation had been regarded as the foundation of all the liberty, protection and co-operation that the Moravian Brethren have enjoyed ever since under the British and Newfoundland governments.

Haven went along the Coast of Labrador in an Irish fishing smack. For a time he was unable to make contact with the Eskimos because the crew of the smack opened fire on the Eskimos whenever they saw them. Eventually Haven, dressed in a Greenland costume, made contact with the Eskimos and speaking to them in their own language he was at once greeted as a friend and countryman and was urged to go ashore. He was taken ashore by some of the ship's crew who immediately withdrew and waited to see

what would happen. The Eskimos swarmed around him and for about two hours Haven conversed with them in the Greenlandic tongue, which they evidently understood quite well. He advised them how to behave toward the English and begged them not to steal. The natives retorted that the English also stole. Haven explained that stealing was contrary to British law and that if the English offended against them in this way they were to tell him and he would see that the thieves were punished. Good relations were established and Haven promised to return the following year. This promise was kept and three other Brethren went with Haven to the Coast. Upon their return they were able to make a favourable report and it seemed now that the way was clear for the Moravian Mission to start work in Labrador. However government red tape held up the projected Mission.

The Moravian Brethren's experience among the North American Indians had taught them that if they were to be successful in their work they would need more than just little plots of land and they asked that nothing less than a grant of a hundred thousand acres in connection with each established settlement be made to them. This was not at all to the liking of the authorities; even Governor Palliser grew silent and suspicious. But the Brethren were firm and unyielding in their demand; the reason they gave was that the vicious and debasing influence of European traders and fishermen who frequented the Labrador Coast made it necessary that the natives should be preserved as far as possible from the evil done by those Europeans. In 1769 the matter was settled and the Moravian

Eskimo children carrying rhubarb.



*The nursing station
at Happy Valley,
Labrador.*



Brethren were granted one hundred thousand acres for their first settlement on the Labrador Coast. Visits were made in 1769 and 1770, and in 1771 the work was established at Nain. The party consisted of Jens Haven and his wife; Christoph Brasen, a surgeon, and his wife; Johann and Mrs. Schneider; and Christen Larsen Drachard, who was over sixty years of age and who like Haven had been a missionary in Greenland and knew the Eskimo language. Thus was established a Mission which has continued for one hundred and eighty-nine years without cessation.

During the first winter the missionaries found life very difficult. The natives were short of food and expected the missionaries to feed them from their small stock. There was scarcely any ptarmigan and there were few seals. On December 31st, Jens Haven

wrote in the station diary: "... it is indeed true that we found much less of the resources of Life this year in this place than has been imagined and that we have only hitherto got 30 odd Rypers [ptarmigan] and caught but 5 foxes." The temperature that day was 41° below zero. On February 7th, 1772, Haven wrote in the diary, "If every year's winter is like this they [the Eskimos] cannot go out in winter to gather cranberries and other berries as they do in Greenland towards their maintenance; it is indeed a great hardship. The snow lies much deeper here on the lower hills and in the valleys than in Greenland. One does not find in opening the Rypers that they have any berries in their stomach but only leaves and buds of trees, whereas they live on berries in Greenland for the most part." Earlier, in January, he wrote that the

*Mrs. F. W. Peacock and
Dr. G. A. Frecker, New-
foundland Minister of
Education, with a group
of Brownies.*





(Top): Eskimo assistants at the Nain hospital.

(Centre): Eskimo women wearing parkas. Nain church is in the background.



members of one family were suffering from hunger and that they went out to get muscles (mussels) and sea grass to eat. He also notes that the Eskimos got the mussels with great labour from under ice eight to ten feet thick on the shore. The small black cod-fish (rock cods) which were to be had throughout the winter in Greenland could not be caught until March or even later. The missionaries shared as much as possible with the Eskimos but sometimes wondered whether the Eskimos were not inclined to be lazy and content to live on what they could beg from the missionaries. Missionary Schneider was shocked at the cruelty of the Eskimos toward their dogs.

In December the Eskimos had made excuses to the missionaries for wishing to leave the vicinity of the mission-house, saying that they wished to go north to catch whales but the missionaries discovered that their motive was to take part in the Festival of the Sun. Unfortunately diaries do not give any description of the festival. In July the missionaries were disgusted by the heathen ceremonies which took place near the mission-house. Again no description of the diversions and ceremonies is given except the remark that they were "too tedious to mention".

Although these Eskimos had received Haven gladly, it was soon clear that they had no intention of readily accepting the Gospel. Haven and his Brethren had come to proclaim. It was six years before the first convert was made and he remained faithful to his baptismal vows for thirteen years; then he went south on a trading expedition and returned with two wives. When called to task about this he naively explained that he needed the second wife to "man" his new boat. The shamans had been active against the Mission in the early days but were gradually won for Jesus Christ. The work spread and in 1776 another Mission station was established at Okak and in 1782 at Hopedale; later stations were established at Hebron, Ramah, Zoar, and Killinek. At the close of the nineteenth century a station was established for the "Settler" population at Makovik. In 1954 a church was opened in Happy Valley near Goose Airport. This church was built and paid for, and run by the Settler and

(Bottom): The Moravian Mission at Hebron, Labrador.

One of the missionaries and his wife leave Nain for a sledge trip.

Eskimo laymen who had come from the north to find work at the airport. Services in both the English and the Eskimo languages were maintained by these laymen, a tribute to the teaching they had received from their beloved missionaries in the north.

Over the years some of the more northerly stations have been closed. There has always been a trend southward and this contributed to the closing of some of the stations. The station at Okak was closed after the Spanish influenza epidemic in 1919, which carried away almost three-quarters of the population. With the establishment of Goose Bay Airport the trend south increased in tempo and the Labrador Eskimo today is no longer content with the precarious living which was his before the Second World War; he now wants a steady wage and the amenities of civilization as far as they are available in Labrador. Because of this southward trend and the desire of the Eskimos for better living conditions, the year 1959 witnessed the closing of the most northerly of the Moravian Mission stations and the inhabitants were moved from Hebron to the more southerly stations of Nain, where there is a modern school and cottage hospital, Hopedale and Makkovik, where there is a greater possibility of obtaining employment.

An understanding Newfoundland government has done much to help the Moravian Mission in its dealings with the Eskimos, and we are moving toward the day when the Eskimos of Labrador will take their place be-



side their white brothers as full and educated citizens.

This brief history has left much unsaid for it has told nothing of the medical or educational work of the Moravian Mission, but to tell the full story would fill many pages. The missionaries of the Moravian Brethren have contributed much to the knowledge of the Eskimos and their language, and to the knowledge of the flora and fauna of Labrador. The history of Labrador North has been, until comparatively recent years, the history of the Moravian Missions on the Coast, and most authorities admit that were it not for the Moravian Mission the Labrador Eskimos would have died off long ago and their life would have faded into the pages of history.

An Eskimo family at home, Nain, Labrador.



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EDITOR'S NOTE-BOOK

The Reverend F. W. Peacock (*The Moravian Mission in Labrador*) was born in England in 1907, and was educated at Eastville Boys' School, Moravian Theological College at Fairfield, and Manchester University. He was ordained deacon in the Moravian Church in 1935 and in that year he went to Labrador. He was ordained presbyter in 1940, and in 1941 was made Superintendent of Moravian missions in Labrador. Mr. Peacock obtained his Master's degree from the University of Montreal in 1948 with the thesis "Some Psychological Aspects of the Impact of the White Man Upon the Labrador Eskimo." He was transferred with the Moravian mission headquarters from Nain to Happy Valley in 1957.

Phyllis MacNeill (*They Are Changing the Face of Saskatchewan*) graduated from the University of Saskatchewan in 1951 with the degree of Bachelor of Arts. She was subsequently employed as a writer by the Saskatchewan Industrial Development Office, and is now employed in the same capacity by the Saskatchewan Department of Travel and Information.

* * *

Helen Bush (*Fossil Discovery in Peru*) was educated at Queen's University, Kingston, and is a part-time lecturer with the Division of Education, Royal Ontario Museum, Toronto.

* * *

Donovan Clemson (*British Columbia Lakes*) is a free-lance photographer who lives in Armstrong, British Columbia. His photographs of the province have appeared previously in the Journal.

* * *

ERRATUM

Vol. LX, No. 3, pp. 89-90. In the article "The Story of Helicopters in Canada" in the March, 1960, issue, the mountains in the area of the Kitimat-Kemano development were incorrectly referred to as the Rockies. The mountains in the development area are, of course, part of the Coast Range. We regret the error.

AMONGST THE NEW BOOKS

Anglo-America—A Regional Geography

by Earl B. Shaw

(John Wiley & Sons, Inc., New York, 480 pp. \$7.75)

Another book has been added to the growing library of textbooks on Anglo-America. This book, which is designed for college use at an introductory level, takes its place on the book shelves alongside several illustrious predecessors. In outline the book follows the standard regional approach to Anglo-America. In addition there is a valuable chapter on Greenland.

There is an introductory chapter on North America as a whole ("North America, Overview") and a final chapter ("North America: Outlook"). Between these two chapters, are fourteen that discuss the geography of the various regions of Anglo-America.

The regional breakdown that is used is fairly standard and introduces nothing new to the regional geography of the area. Within each chapter there is a discussion of the physical environment and a description of the major economic activities. At the end of each chapter there is a set of questions and problems and a selected list of references.

A few errors, particularly in connection with Canada, have found their way into the text. On page 138, Halifax is referred to as a British naval base; on page 215 reference is made to the south-east coast of British Columbia; on page 324 the author omits the fact that the Canadian National Railways also reach the Pacific at Vancouver, and overlooks the fact that the Pacific Great Eastern Railway now crosses the Rocky Mountains into the Peace River District.

On page 169 the author refers to 6,000,000 acres of Appalachian timberland being set aside in national parks. From the subsequent description of the handling of the forest crop, I am sure that he means National Forests. There is a fundamental difference between the National Park Service of the United States and the U.S. Forest Service in the management of timber and other resources in areas under their jurisdiction.

These points are not major ones.

(Continued on page VII)

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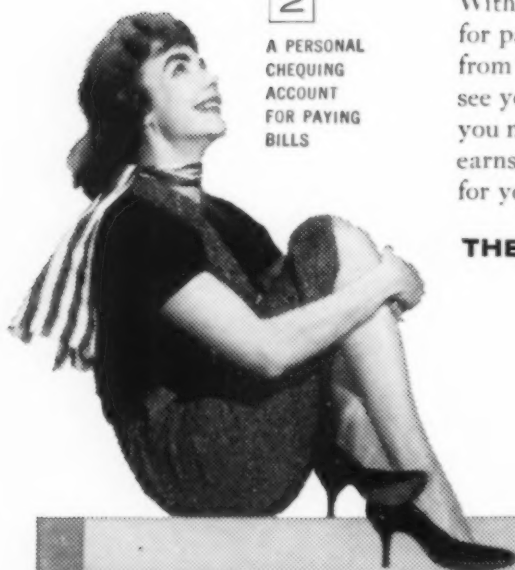
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Personal Chequing Account

(Continued from page V)

but they are included in this review to show that errors do show up even in the best-written books and tend to detract from the overall value of the publication.

Nowhere in the chapter on "The Great Plains" is reference made to the three major cities of the Canadian Prairies — Winnipeg, Edmonton and Calgary. The rapid changes of the last few years on the Prairies and the extremely rapid growth of these cities would seem to be a basic part of the regional geography of the Great Plains.

The book is well illustrated with photographs and there are some excellent maps which have been prepared by Mr. Jameson MacFarland.

GORDON D. TAYLOR

Mr. Taylor is a geographer in the Provincial Parks Branch, Department of Recreation and Conservation, Victoria, B.C.

In Quest of the North West Passage

by Leslie H. Neatby

(Longmans, Green and Company, Toronto. 194 pp. \$3.75)

In this scholarly and very readable book Professor Neatby describes the search for the Northwest Passage which started with Frobisher's voyage in the *Gabriel* and ended with M'Clintock's in the *Fox* in 1857-9. By masterly treatment of a mass of material Professor Neatby has unfolded the story in a way which shows, in the words of Dr. J. Tuzo Wilson in the foreword, "... the purpose and meaning of otherwise disconnected voyages by placing them in the context of contemporary history". His assessment of the contribution of each of the great pioneers is just and reasonable.

The author's lucid prose and his deep sense of the historical continuity of the quest are matched by his skill in weaving biographical detail and character sketch into the story of

(Continued on page X)



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(Continued from page VIII)

those who voyaged to explore Arctic Canada. He is equally skilful in his choice of anecdotes, often dryly humorous, which illuminate the narrative with a warm, human interest.

There is a useful bibliography of some sixty items, but unfortunately an index is lacking and the excellent maps by George Falconer do not show all the place-names mentioned in the text. Some readers might wish for a contemporary map of the Canadian Arctic in 1845 for a full appreciation of the problems which faced Franklin, as he set out on his last voyage. We notice a reference to "Sir John Franklin's Order of Merit", although that Order was not instituted until 1902; and the statement that, after the return of the *For* to England, "the work of the British seaman in the Canadian Arctic was over", which ignores the discoveries of the British Arctic Expedition of 1875-6 sent out by the Admiralty under Nares. Otherwise, the most captious critic will find little cause for complaint in this book.

G. HATTERSLEY-SMITH

Dr. Hattersley-Smith has worked in the Arctic and Antarctic. He has been with the Defence Research Board since 1951.

* * *

The Desperate People

by Farley Mowat

(Little, Brown and Company
(Canada) Limited, Toronto.

305 pp. \$5.00)

The history of the social disintegration of the Ihalmiut, a tribe of Caribou Eskimos who lived near the Kazan River is the central theme of this book. The author attributes this disintegration to the white man's influence through contact with the Hudson's Bay Company, missionaries, Royal Canadian Mounted Police, and white trappers.

The author states that aboriginally, caribou hunting was the economic basis of Ihalmiut culture. On the introduction of firearms, the numbers of caribou became seriously diminished and the herds also changed their migration routes thereby avoiding Ihalmiut territory. This has resulted in gradual starvation for the people during the past forty years.

The Ihalmiut had been relocated in various other hunting grounds but these proved to be poorer in game than the original area and the author maintains that these relocation plans have been badly bungled, and mentions various governmental agencies and officials as the culprits. Today the remaining forty-three Ihalmiut live at the Keewatin Rehabilitation Cen-

tre at Rankin Inlet where they are properly cared for medically, educationally and economically by the Department of Northern Affairs and National Resources. Many of them are employed at the North Rankin nickel mine. The process of assimilation to the white man's culture is enabling these people to share the material benefits of western civilization.

Mr. Mowat's style is facile and interesting although it is complicated throughout by a polemical tone. He makes many accusations against various agencies for mismanagement of the Ihalmiut problem. The truth of these accusations is denied by the accused. In any case, true or false, the Ihalmiut seem to be destined for a better life.

LAWRENCE OSCHINSKY

Dr. Oschinsky, Ph.D. is curator of physical anthropology in the division of Archaeology at the National Museum at Ottawa.

* * *

Ships and the Seaway

by F. J. Bullock

(J. M. Dent and Sons, Don Mills.
115 pp. \$3.95)

If you are the kind of person unable to resist a look of sneaking admiration at the ship which caused the traffic to back-up for half a block last time you were stuck at the bridge, or if the glint of sunshine on a distant waterway impells you to lift your weather eye from the endless ribbon of the highway, then you should make a point of stowing *Ships And The Seaway* in the glove compartment, for here is a book which is an asset to any car from Halifax to the Lakehead.

The broad theme covers the history and development of the St. Lawrence system and of the vessels that pass thereon upon their lawful occasions. Variations include sections on the ports and channels, an excellent chapter on the problem of ice in the river, a chatty little section on the elements of ship recognition and a number of well chosen illustrations including coloured end-plates of house-flags and funnels. Strangely enough, while most people have some idea of the romantic story of the railways that opened up the granary of the Canadian West, few have even heard of some of the great shipping firms, few of them alas our own, which have made it possible to realize our golden assets. The fact remains that the industry includes, by and large, some of the most far-seeing and competent people on this earth.

I have remarked before that when

(Continued on next page)

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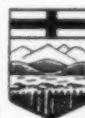
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(Continued from previous page)

sailors take to the pen they usually exhibit a natural and workmanlike style which, free from pretentious phrasing, is the essence of good writing. Captain Bullock is no exception to this general rule and his experience as a deep sea shipmaster in Canadian waters enhances his remarks with a ring of authority that is at once accurate and anecdotal, informative without being dull. Messrs. Dent have produced an attractive little book and I shall be very surprised if the author does not find himself invited to revise this unique Canadian reference as the tide of shipping eddies in our sea road to the world.

THOMAS E. APPLETON

Lieutenant-Commander Appleton, P. Eng., M.E.I.C., is on the staff of the Naval Constructor-in-Chief at Ottawa.

* * *

Sir Casimir Stanislaus Gzowski
by Ludwik Kos-Rabcewicz-Zubkowski and William E. Greening
(Burns and MacEachern, Toronto. 197 pp. \$4.75)

Since the last war, Canada has received from Europe members of the engineering, medical and scientific professions, many of whom are contributing substantially in their chosen fields. Probably none of these will have an impact on our material development to equal that of Sir Casimir Gzowski who rose to eminence as a consulting engineer in Canada in the 1840-1890 period.

There are romantic overtones to his story. As a young member of the minor aristocracy in Poland, he took part in an uprising against Russian oppression, was exiled to the United States and arrived there in 1834, practically penniless, with no knowledge of the English language.

In a few years' time his natural ability together with hard work enabled him to become a practising lawyer in Massachusetts. However, he soon returned to his first love — the profession of engineering. By 1841 he had worked his way across the border and we find him in a senior engineering capacity building roads and improving lake harbours in Upper Canada. One of his assignments at this time was the transformation of what is now Highway 11 — north from Toronto to Barrie, from a muddy back-woods trail to a passable roadway by the use of the broken stone treatment developed by James Macadam.

Much of his active professional career was concerned with early rail-

(Continued on page XIII)



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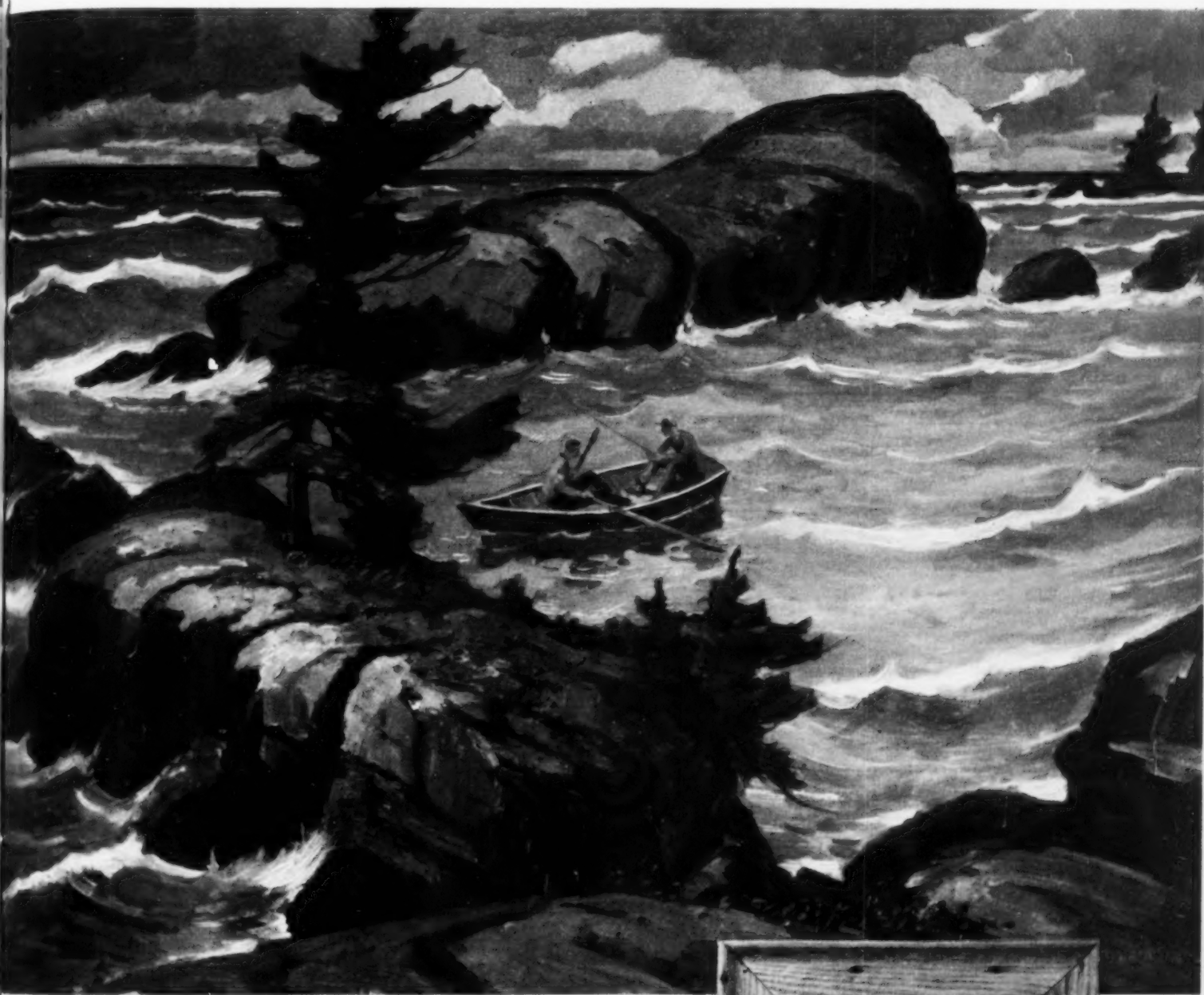
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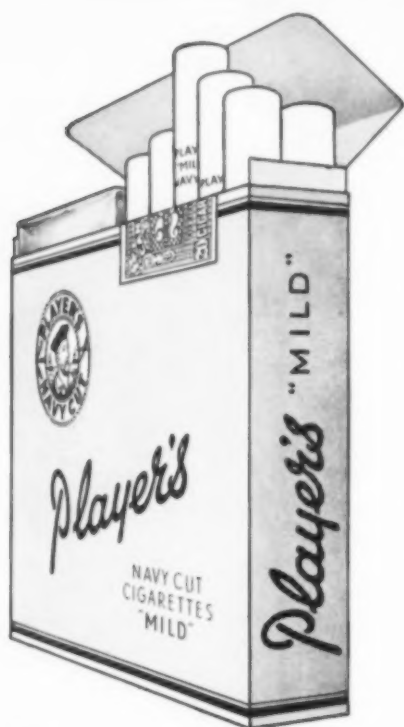
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(Continued from page XI)

way development. There are interesting accounts of the construction of the first rail line from Montreal to Portland, Maine — with its wood-burning locomotives. Later he was involved in building the Grand Trunk. We are made aware of the clash of rival financial interests, political lobbying — inefficient contractors and all the other ills which accompanied the great surge of railway building from the mid-century onwards.

Gzowski had many interests. He rose to the top in his profession and his advice as a consultant was widely sought. He was one of the founders of what is now the Engineering Institute of Canada. He was one of the group responsible for the inception of Wycliffe College, took an interest in military affairs and concerned himself with the defence of Canada during Fenian Raids.

He amassed a considerable fortune during his lifetime and received many honours and awards. He moved in a circle which included many of the foremost political and financial figures of the day and was a trusted friend of Sir John A. Macdonald.

ALAN K. HAY

Mr. Hay is General Manager of the National Capital Commission at Ottawa.

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